



COUNTY OF LOS ANGELES DEPARTMENT OF HEALTH SERVICES
IMMUNIZATION PROGRAM
CLINIC RECORD AUDITS, JUNE-JULY 2003
SEPTEMBER 2003

Background

As part of its mandate to increase vaccination coverage rates in Los Angeles County (LAC), the LAC Immunization Program provides various vaccines to Department of Health Services (DHS) health centers/hospitals and nonprofit health care providers that receive immunization subvention contract funds (community health centers - CHC). In order to measure vaccine coverage rates of children seeking immunization services at these facilities, monitor changes in vaccination coverage levels among clinic patients at these facilities, and identify ways to improve vaccine service delivery, the medical records of their 2 year-old clients are audited each year during the months of June and July.

Methods

Eligibility

- Children who were 24-35 months of age as of June 1.
- Exclusion criteria in 1999 and earlier:
 - Client had a long-term (1 year or more) medical contraindication to vaccination
 - Evidence in the medical record that the client had changed to another health care provider, moved from the local area served by the clinic, or routinely received vaccinations from another provider
 - Evidence in the medical record that efforts by the clinic staff to contact the client by mail or telephone were unsuccessful
- Exclusion criteria in 2000 and 2001:
 - Evidence in the medical record that the client had changed to another health care provider, moved from the local area served by the clinic, or routinely received vaccinations from another provider
- Exclusion criteria in 2002 and currently (in order of priority):
 - Evidence in the medical record that the client had changed to another health care provider, moved from the local area served by the clinic, or routinely received vaccinations from another provider
 - Client had received health care at the facility more than 12 months ago OR facility does not have a method of reminder recall in place
 - Client had less than or equal to one medical encounter at specific facility

Sample Design

- Clinics with 200 or fewer eligible clients, medical records for all eligible clients were selected for review.
- Clinics with more than 200 eligible clients, a systematic random sample of medical records generated with the sampling software in the Clinic Assessment Software Application (CASA).

Collected Data

- Eligible client's date of birth and vaccination dates since the birth date.
- Data were collected using CASA (developed by the Centers for Disease Control and Prevention National Immunization Program).

Data Analysis

- For each clinic type (DHS vs. CHC), vaccination rates are estimated by dividing the number of eligible records that meet the antigen- or series-specific recommended doses at critical age milestones by the total number of eligible records reviewed.

Results

The 2003 audit included children who were born from June 1, 2000 through May 31, 2001.

In this report, the results are grouped into four categories:

- I. Sample Size.
- II. Estimated Vaccination Coverage with Individual Vaccines and Selected Vaccination Series.
– General Summary and Trends.
- III. Estimated Vaccination Coverage with Individual Vaccines by Age Milestone.
- IV. Healthy People 2010 Objectives and Los Angeles County Status.

I. Sample Size

Table 1. Sampled clinics and eligible children 24-35 months of age by clinic type, Los Angeles County Clinic Record Audits, 1999-2003

Year	DHS Facilities		CHC Clinics		Total	
	Clinics	Eligible Records	Clinics	Eligible Records	Clinics	Eligible Records
2003	28	2,250	18	1,547	46	3,797
2002	37	2,903	19	1,636	56	4,539
2001	41	3,304	13	823	54	4,127
2000	30	3,524	26	1,734	56	5,258
1999	45	5,404	27	2,177	72	7,581

In 2003, two hospital-based pediatric clinics and 26 health centers comprised the 28 DHS facilities. The number of clinics and eligible records that were reviewed has remained somewhat similar since 2000. However, the small variability across years in the number of assessed clinics is due to the year 2000 LAC Immunization Program policy to reduce assessments performed at immunization only clinics in select DHS facilities as well as various clinic closures.

II. Estimated Vaccination Coverage with Individual Vaccines and Selected Vaccination Series – General Summary and Trends

Table 2. Estimated vaccination coverage levels at the 24 month age milestone among children 24-35 months of age by clinic type, Los Angeles County Clinic Record Audits, 2003

Vaccine(s)	DHS Facilities (N=2,250)		CHC (N=1,547)	
	Overall Clinic %	Clinic Range*	Overall Clinic %	Clinic Range*
4 DTaP/DT	65.4	(21.2, 93.8)	87.6	(50.8, 98.4)
3 DTaP/DT	83.9	(39.7, 100.0)	96.3	(68.3, 100.0)
3 Poliovirus	80.9	(39.7, 100.0)	95.6	(66.7, 100.0)
1 MMR ¹	82.1	(26.0, 96.5)	92.5	(47.6, 100.0)
3 Hib	77.3	(28.8, 95.4)	93.6	(60.3, 99.5)
3 Hepatitis B	76.4	(28.8, 97.9)	93.2	(58.7, 100.0)
1 Varicella	76.4	(27.4, 100.0)	89.3	(54.0, 99.0)
4:3:1 ²	61.9	(17.8, 91.7)	84.8	(41.3, 95.7)
4:3:1:3 ³	59.6	(15.1, 87.5)	83.3	(39.7, 95.2)
4:3:1:3:3 ⁴	57.6	(15.1, 87.5)	82.4	(39.7, 95.2)

¹ Measles-Mumps-Rubella vaccine.

² Four or more doses of DTaP/DT, three or more doses of poliovirus vaccine, one or more doses of MMR.

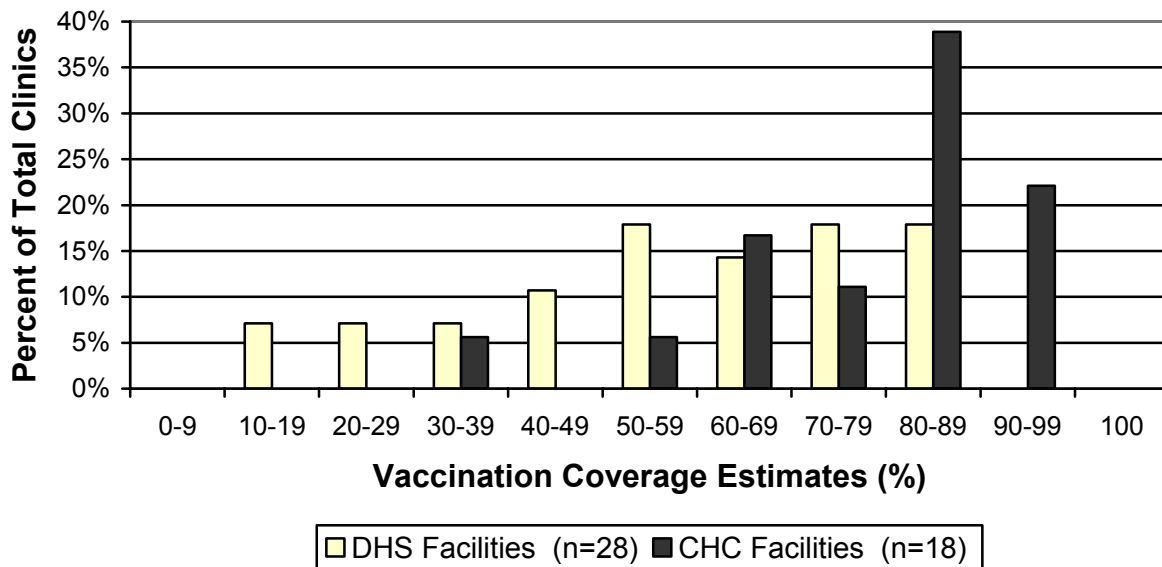
³ Four or more doses of DTaP/DT, three or more doses of poliovirus vaccine, one or more doses of MMR, and three or more doses of Hib.

⁴ Four or more doses of DTaP/DT, three or more doses of poliovirus vaccine, one or more doses of MMR, three or more doses of Hib, and three or more doses of hepatitis B vaccine.

*The range of individual clinic coverage estimates.

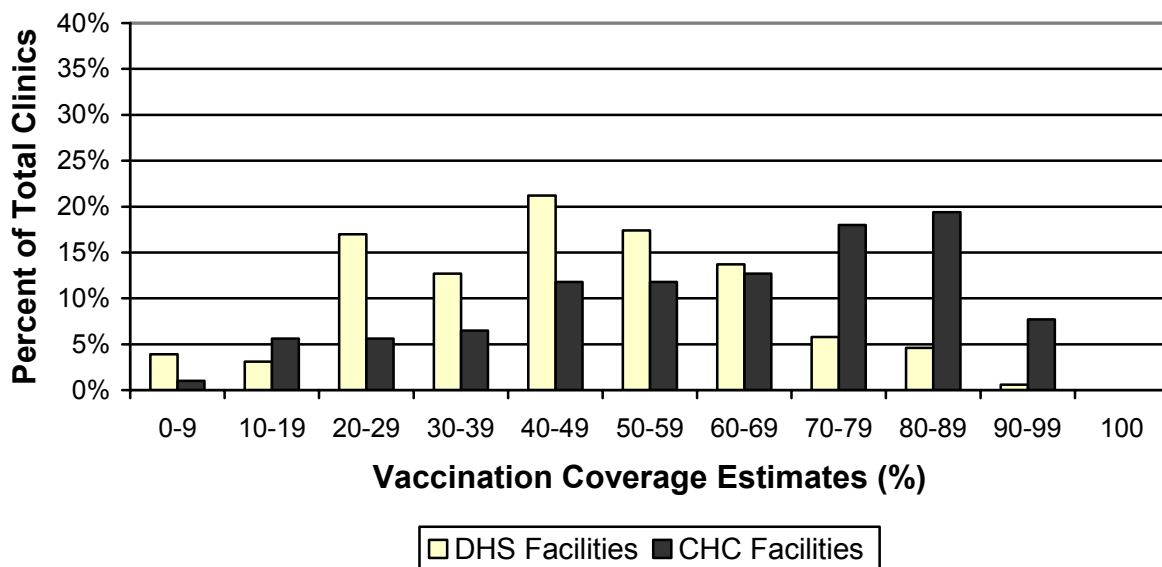
When comparing vaccine coverage estimates between the DHS and CHC facilities, the latter facilities' estimates are significantly higher for every individual vaccine and series, although the variability across clinics is dramatic. For the DHS facilities, individual vaccine coverage estimates were highest for three doses of diphtheria, tetanus toxoids, and pertussis (DTaP/DT) vaccine at age 24 months and lowest for four doses of diphtheria, tetanus toxoids, and pertussis (DTaP/DT) vaccine. For the CHC facilities, estimates were highest for three doses of diphtheria, tetanus toxoids, and pertussis (DTaP/DT) vaccine and lowest for four doses of diphtheria, tetanus toxoids, and pertussis (DTaP/DT) vaccine.

Figure 1. Estimated vaccination coverage with four DTP, three polio, one MMR, three Hib, three Hep B (4:3:1:3:3) at the 24 month age milestone among children 24-35 months of age by clinic type, Los Angeles County Clinic Record Audits, 2003



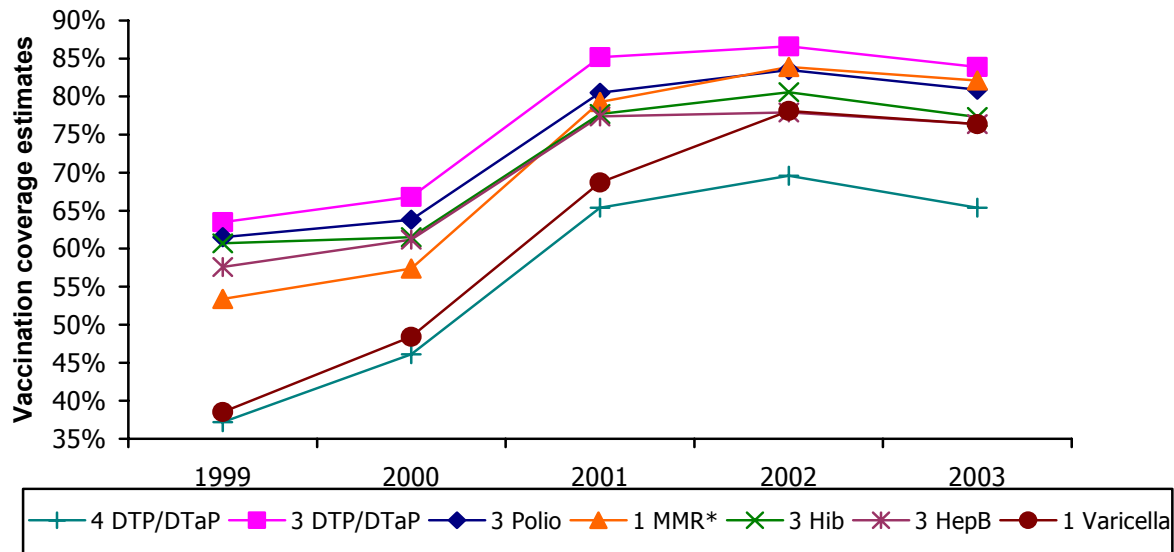
In this graph, the variability in coverage estimates is evident among the DHS facilities with the lowest clinic estimate at 15.1% and the highest at 87.5%. In contrast, the majority of CHC facilities had much higher end estimates, ranging from only one clinic at 39.7% to four of the 18 CHC clinics with an above 90% coverage estimate.

Figure 2. Estimated vaccination coverage with four DTP, three polio, one MMR, three Hib, three Hep B (4:3:1:3:3) at the 24 month age milestone among children 24-35 months of age by clinic type, Los Angeles County Clinic Record Audits, Average 1999-2002



Although the CHC facilities had higher end estimates than DHS facilities even prior to 2003, the average yearly estimates in both types of facilities are much more varied, indicating an overall improvement in coverage through the years.

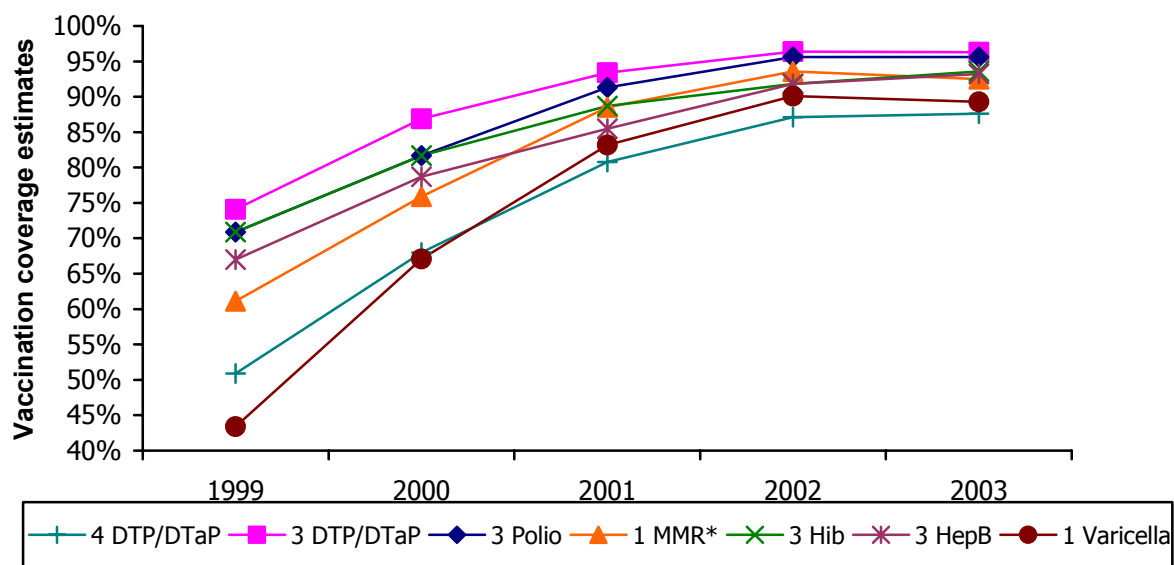
Figure 3. Estimated vaccination coverage with individual vaccines at the 24-month age milestone among children 24-35 months of age at DHS facilities, Los Angeles County Clinic Record Audits, 1999-2003.



*Measles-Mumps-Rubella vaccine.

In this graph, the dramatic increases in coverage in each individual vaccine can be evidenced, with varicella and 4 DTaP/DT increasing the most from 1999 to 2003 (increasing 98.4% and 75.8%, respectively). With the exception of 4 DTaP/DT, coverage estimates have stabilized in all individual vaccines since 2001, after a significant improvement from 1999-2001.

Figure 4. Estimated vaccination coverage with individual vaccines at the 24-month age milestone among children 24-35 months of age at CHC facilities, Los Angeles County Clinic Record Audits, 1999-2003.



*Measles-Mumps-Rubella vaccine.

The coverage estimates in CHC facilities have been steadily increasing since 1999 and have reached a plateau in 2002 with coverage estimates above 90% for all vaccines excluding 4 doses of DTaP/DT and 1 dose of varicella.

Table 3. Estimated vaccination coverage levels at the 24-month age milestone among children 24-35 months of age by clinic type, Los Angeles County Clinic Record Audits, 1999-2003.

Year	4:3:1 series ¹		4:3:1:3 series ²		4:3:1:3:3 series ³	
	DHS	CHC	DHS	CHC	DHS	CHC
1999	34.6	47.4	33.4	45.9	31.3	43.1
2000	42.5	63.4	40.4	60.7	38.1	58.2
2001	60.8	76.8	57.4	74.1	54.7	71.8
2002	65.9	84.5	63.7	82.3	60.3	80.9
2003	61.9	84.8	59.6	83.3	57.6	82.4

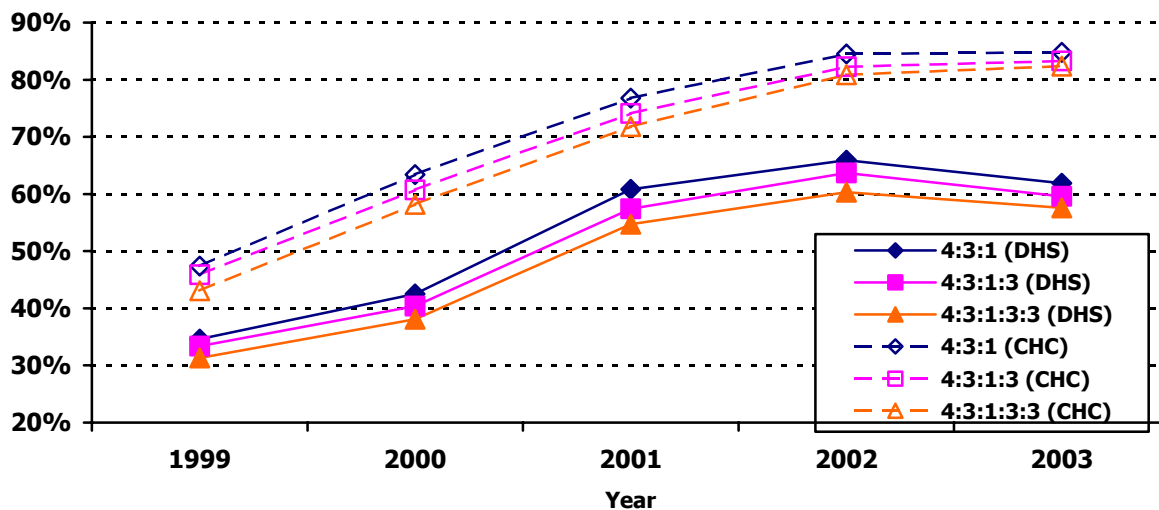
¹ Four doses of DTaP/DT, three doses of poliovirus vaccine, one dose of MMR.

² Four doses of DTaP/DT, three doses of poliovirus vaccine, one dose of MMR, and three doses of Hib.

³ Four doses of DTaP/DT, three doses of poliovirus vaccine, one dose of MMR, three doses of Hib, and three doses of hepatitis B vaccine.

The CHC facilities have improved vaccine coverage rates for all three series since 1999. Although not as dramatically, this was also the case for the DHS facilities until 2003, when vaccine coverage rates decreased for all three vaccine series. These results are also displayed graphically in figure 5.

Figure 5. Estimated vaccination coverage levels at the 24 month age milestone with selected vaccination series among children 24-35 months of age by clinic type, Los Angeles County Clinic Record Audits, 1999-2003



The coverage differences between the two types of facilities in all three series estimates have been increasing over the years. In 1999, there was an 11.8 point difference between the 4:3:1:3:3 DHS and CHC estimates, but in 2003, there was a 24.8 point difference. Similar differences were evidenced with the other two vaccine series.

Estimated coverage levels for the different series are usually lower than the estimated coverage levels for the individual vaccines. Delaying the fourth dose of DTaP is the primary reason why vaccine coverage levels for the 4:3:1, 4:3:1:3, and 4:3:1:3:3 series are not higher.

III. Estimated Vaccination Coverage with Individual Vaccines by Age Milestone

Table 4. Required number of doses of individual vaccines at 3, 5, 7, 13, 16, 19, and 24 months of age.

Age (months)	DTaP/DT	Polio	MMR	Hib	Hep B
3	1	1	0	1	1
5	2	2	0	2	2
7	3	2	0	2	2
13	3	2	0	3	2
16	3	2	1	3	2
19	4	3	1	3	3
24	4	3	1	3	3

Coverage estimates are presented for the age milestones of 3, 5, 7, 13, 16, 19, and 24 months of age. The required number of doses of individual vaccines at each age milestone for which coverage was estimated is shown in Table 4. Four Hib conjugate vaccines are licensed for use in infants 6 weeks of age and older. One of these requires only two primary doses, as opposed to three primary doses, for children immunized before 7 months of age. This particular vaccine is also the Hib component in the combination Hib and hepatitis B vaccine, which is widely used in Los Angeles County. For this reason, the assessment of Hib coverage levels at 7, 13, 19, and 24 months is based upon the schedule for the vaccine requiring two primary doses.

Figure 6. Estimated vaccination coverage with recommended vaccines by age at DHS facilities, Los Angeles County Clinic Record Audits, 1999-2003

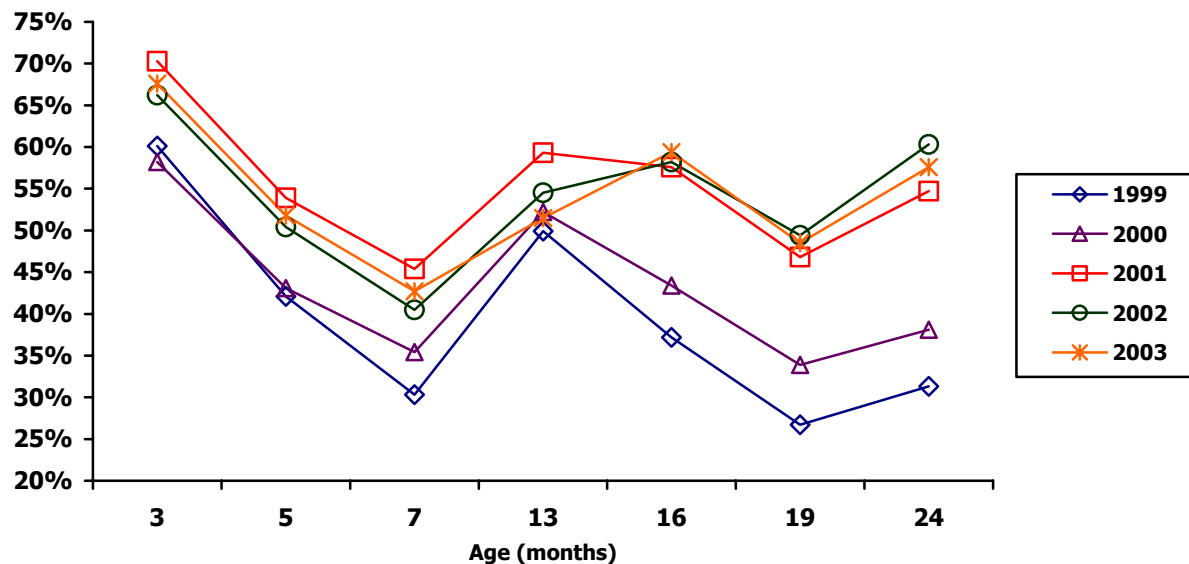
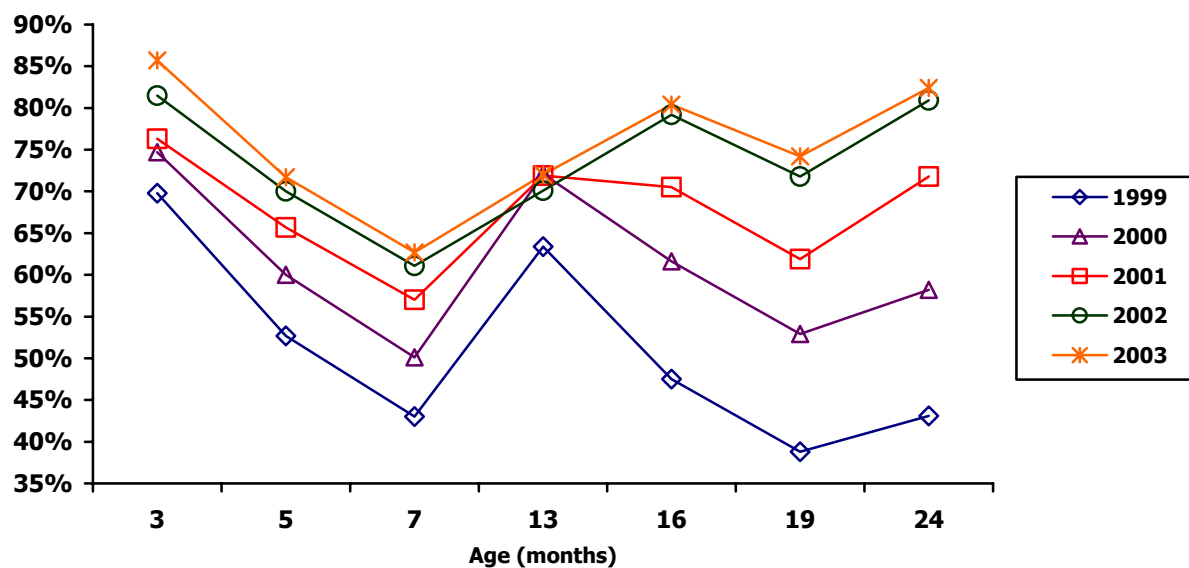


Figure 7. Estimated vaccination coverage with recommended vaccines by age at CHC facilities, Los Angeles County Clinic Record Audits, 1999-2003



For both facility types, coverage estimates for the recommended vaccines peak at 3 and 13 months with the exception of CHC facilities in 2002 and 2003 and DHS facilities in 2002. All years appear to have similar coverage estimates at the 13-month age milestone. Subsequently, estimates rise again after 19 months. However, for the DHS facilities, estimates after 19 months do not rise as high as the 3-month age milestone estimates. Over the years, improvements in coverage after the 13-month age milestone are being evidenced.

IV. Healthy People 2010 Objectives and Los Angeles County Status

Table 5. Immunization objectives for Healthy People 2010, target coverage levels vs. Los Angeles County clinic audit coverage estimates at 24 month age milestone, 2003

Healthy People 2010 Objective	Healthy People 2010 Target (%)	Clinic Audits 2003 DHS Facilities (%)	Clinic Audits 2003 CHC Facilities (%)
Increase in and Maintenance of Vaccination Coverage Levels Among Children Aged 19 to 35 Months			
4 doses DTaP	90	65.4	87.6
3 doses Hib	90	77.3	93.6
3 doses Hep B	90	76.4	93.2
1 dose MMR	90	82.1	92.5
3 doses polio	90	80.9	95.6
1 dose varicella	90	76.4	89.3
Increase in Coverage Levels of Universally Recommended Vaccines Among Children Aged 19 to 25 Months			
4:3:1:3:3*	80	57.6	82.4

*Four doses of DTaP/DT, three doses of poliovirus vaccine, one dose of MMR, three doses of Hib, and three doses of hepatitis B vaccine.

The national 90% vaccination goal for children 19 to 35 months of age was not achieved for any of the vaccines in the DHS facilities, although slightly over 80% of 24-35 month aged children in this population had received one dose of MMR and three doses of polio at 24 months of age. In the CHC facilities, all vaccines excluding four doses of DTaP/DT and one dose of varicella reached the goal. The low coverage level for four or more doses of DTaP/DT is the primary reason that the DHS facilities have not reached the 80% goal for the 4:3:1:3:3 series.

Table 6. Immunization objectives for Healthy People 2010, target coverage levels vs. Los Angeles County coverage estimates at 24 month age milestone from different data sources

Healthy People 2010 Objective	Healthy People 2010 Target (%)	Clinic Audits 2002 DHS Facilities (% children 24-35 months in 2002)	Clinic Audits 2002 CHC Facilities (% children 24-35 months in 2002)	NIS ¹ 2002 (% Children 19-35 months in 2002)
Increase in and Maintenance of Vaccination Coverage Levels Among Children Aged 19 to 35 Months				
4 doses DTaP	90	69.6	87.1	83.7
3 doses Hib	90	80.6	91.8	89.7
3 doses Hep B	90	77.9	91.8	90.4
1 dose MMR	90	83.9	93.6	91.1
3 doses polio	90	83.5	95.6	88.3
1 dose varicella	90	78.1	90.1	88.1
Increase in Coverage Levels of Universally Recommended Vaccines Among Children Aged 19 to 35 Months				
4:3:1:3:3 ²	80	60.3	80.9	76.0
4:3:1 ³	N/A	65.9	84.5	79.6

¹ National Immunization Survey, random-digit telephone survey conducted by the Centers for Disease Control and Prevention National Immunization Program.

² Four doses of DTaP/DT, three doses of poliovirus vaccine, one dose of MMR, three doses of Hib, and three doses of hepatitis B vaccine.

³ Four doses of DTaP/DT, three doses of poliovirus vaccine, one dose of MMR.

Estimates reported in the National Immunization Survey are more similar to the CHC facility estimates from the 2002 clinic audits than the estimates determined in the DHS facilities. A probable explanation for this finding is because the NIS is a population-based survey and there are few DHS facilities in proportion to the size of the LAC population, the probability of sampling a child who obtained immunizations in the public sector is low.

The delay in administration of the fourth dose of DTaP/DT continues to be the reason why LAC overall cannot reach the 80% goal of appropriately vaccinating 24 month aged children (4:3:1:3:3), although in 2002, the CHC facilities reached this goal.

Discussion

Summary

Annual clinic record audits are extremely beneficial in assessing a more complete picture of vaccination coverage in a reliable setting: medical offices. In addition, facility types, such as DHS facilities, can be singled out for needed improvement in immunization delivery and record keeping rather than being masked in an overall LAC coverage estimate.

Many factors still contribute to low vaccination coverage estimates such as missed opportunities for simultaneous administration of all vaccines, complexities of the immunization schedule, not assessing vaccination status at each visit, inappropriate postponement of vaccination because of minor illnesses, and continued misconceptions and mistrust of the safety of vaccines. However, the dramatic coverage differences between DHS facilities and CHC facilities most likely can be explained as an issue of sporadic utilization of the DHS facilities for immunization services. Although the client exclusion criteria and the sample reduction of the number of walk-in immunization clinics have tried to reduce the sample bias of incomplete immunization histories for a child, it is most likely the reason for the dramatically low coverage estimates in the public sector. However, significant improvements in coverage have been evidenced in the DHS facilities over the past five years (84% increase from 1999 to 2003 in the 4:3:1:3:3 coverage).

It is very encouraging that the community health centers have reached national individual vaccine immunization coverage goals in 2003, with the exception of 4 doses of DTaP/DT and varicella. This finding indicates the continued and improved diligence of medical providers to prioritize the delivery of immunization services in their facilities.

As all the various data sources that estimate LAC vaccination coverage have illustrated, immunization goals for the vaccine series can not be achieved County-wide unless improvements are made in all facilities to administer the fourth dose of DTaP/DT at the recommended age: before 24 months of age.

Limitations

Medical record review of a child's immunization history is only as accurate as the record keeping in the facility. Incomplete or inaccurate documentation of received vaccinations, difficulty locating and retrieving medical records, and multiple partial records for a single patient contribute to an underestimation of vaccination coverage rates in these facilities and overall in the County. In the clinic record audits conducted yearly, locating and consolidating records for a particular patient are at the discretion of the facility and the data collector. No attempts are made to contact other providers who also administered certain vaccinations or to verify information with the parent's written immunization record. Although this is a serious flaw in the reliability of the data collected in the audits, it is a problem that is faced by all medical providers alike. The widespread utilization of a local area multi-jurisdictional immunization registry (developed and spearheaded by the LAC Immunization Program) that stores immunization histories in a central repository for participating providers to easily access and update will provide a future useful validation tool for the clinic record audits.

Because of the modifications in the sampling eligibility criteria, the clinic populations across years may not be comparable. Future plans are in discussion to measure coverage estimates separately for all three eligibility criteria during one clinic audit.